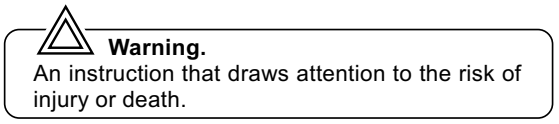
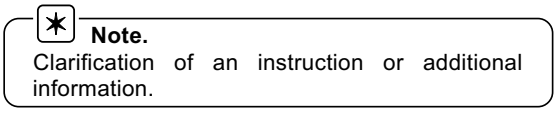
AquaMaster™

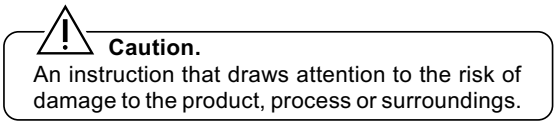
Installation Manual

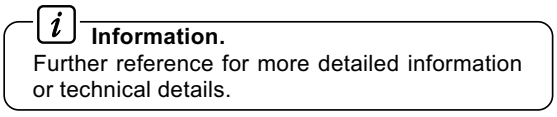
ABB

Use of Instructions









Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Marketing Communications Department.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and parts information.

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CONTENTS

1 INTRODUCTION 1

2 MECHANICAL INSTALLATION 2
2.1 Unpacking 2
2.2 Installation Conditions 2
2.3 Mechancial Installation 4
2.3.1 Transmitters 4

3 ELECTRICAL INSTALLATION 5
3.1 Grounding 5
3.2 Connections 6
3.2.1 Sensor Terminal Box Connections (Remote Versions only) 6
3.2.2 Environmental Protection 6
3.2.3 Transmitter Connections 7
3.3 Input/Output Connections 10
3.3.1 Frequency Outputs 10
3.3.2 Alarm Interface 10
3.3.3 MIL Connector Input/Output Connections (Option) 11
3.3.4 MIL Connector Input/Output (Option) - AquaMag™ x10 Pulse Output Compatibility 12
3.3.5 Encoder Output (Option) 12
3.3.6 Local Computer Connection 13
3.3.7 Remote Computer Connection 14
3.3.8 Power Supply Connection 15
3.3.9 Pressure Transducer (Optional) 16
3.3.10 Environmental Protection 16

4 START-UP AND OPERATION 17
4.1 Connecting Batteries 17
4.2 Start-up 17
4.3 Display Activation 19
4.4 Replacing a Battery 19
4.4.1 Spares Kits 20
4.4.2 Battery Changing Procedures 21

APPENDIX - AQUAMASTER BLOCK DIAGRAM 23

1 INTRODUCTION

AquaMaster™ includes the family of high performance electromagnetic flow meters for water measurement that normally are supplied as factory configured, calibrated systems.

Warning.

- **Installation and maintenance must only be carried out by suitably trained personnel.**
- **All relevant sections of this manual must be read before selecting a location.**
- **Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.**
- **The installation and use of this equipment must be in accordance with relevant national and local standards.**

2 MECHANICAL INSTALLATION

2.1 Unpacking

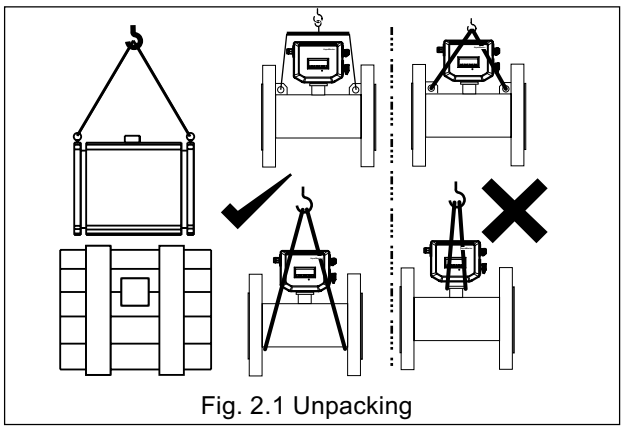


Fig. 2.1 Unpacking

2.2 Installation Conditions

Caution. Do NOT exceed the maximum working pressure marked on the equipment.

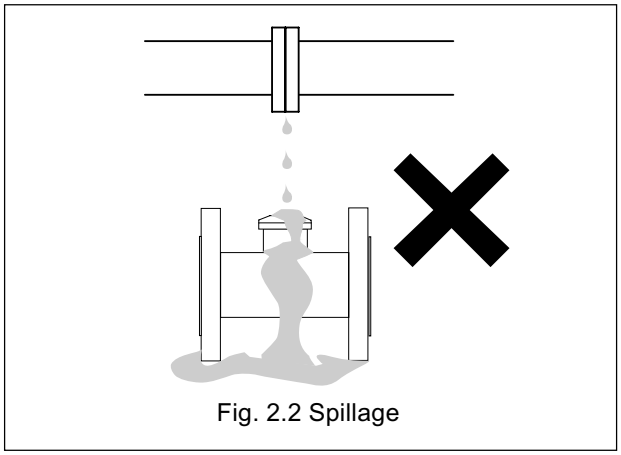


Fig. 2.2 Spillage

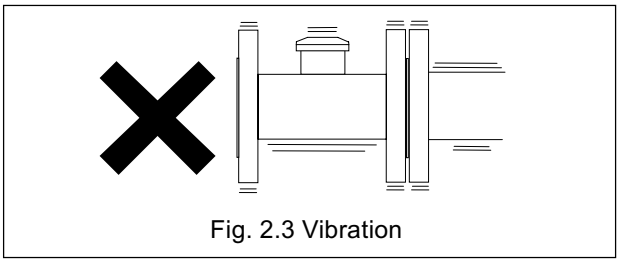


Fig. 2.3 Vibration

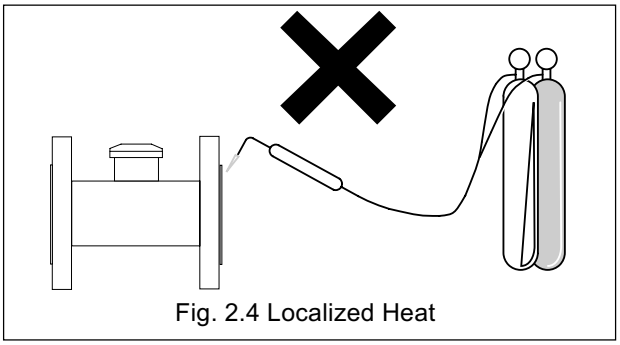


Fig. 2.4 Localized Heat

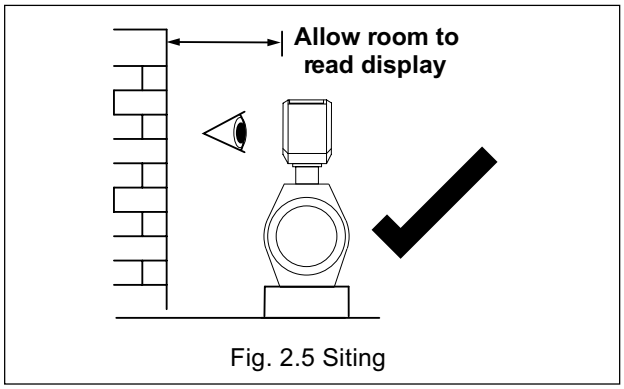


Fig. 2.5 Siting

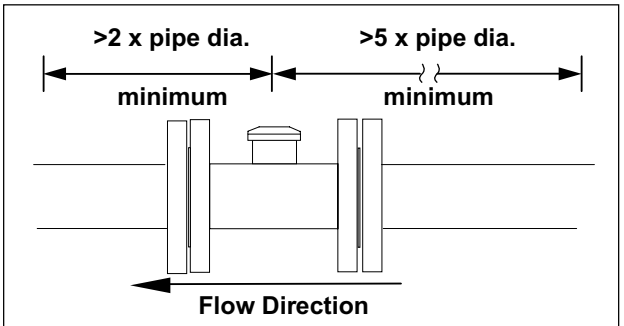


Fig. 2.6 Straight Pipe Requirements

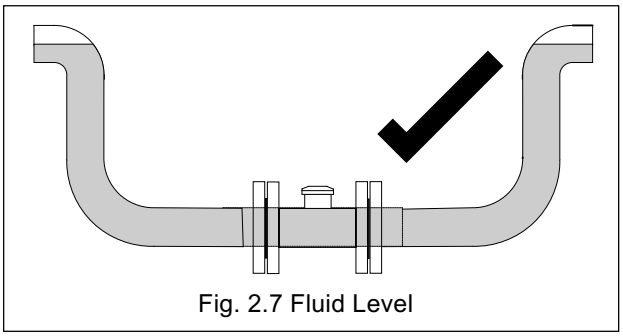


Fig. 2.7 Fluid Level

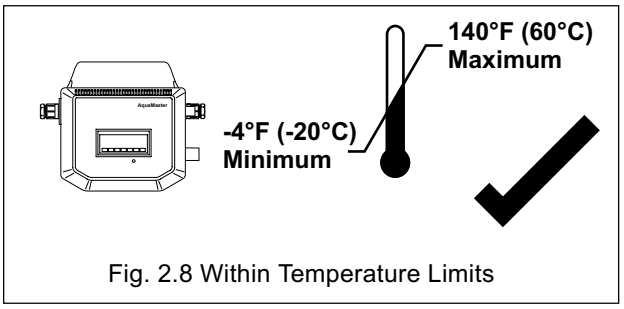


Fig. 2.8 Within Temperature Limits

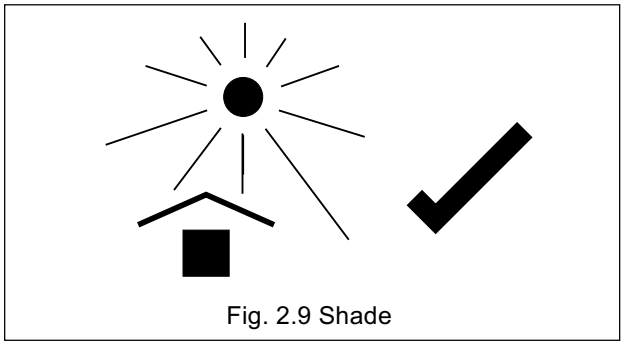


Fig. 2.9 Shade

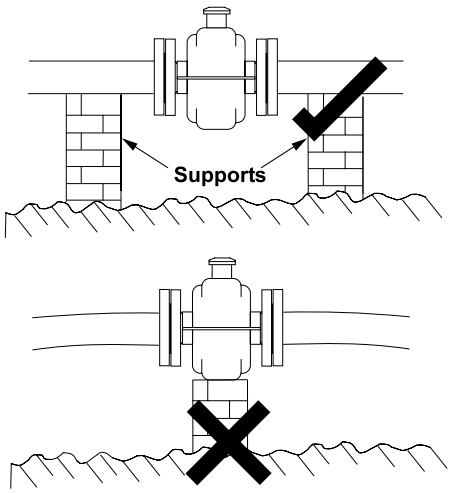


Fig. 2.10 Above Ground

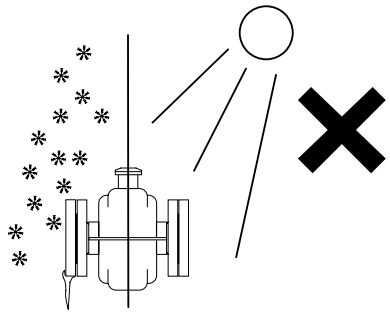


Fig. 2.11 Temperature Difference

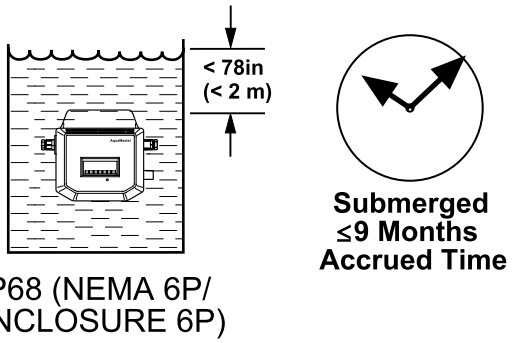


Fig. 2.12 Within Environmental Rating

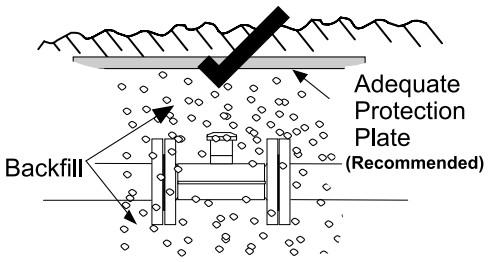


Fig. 2.13 Underground

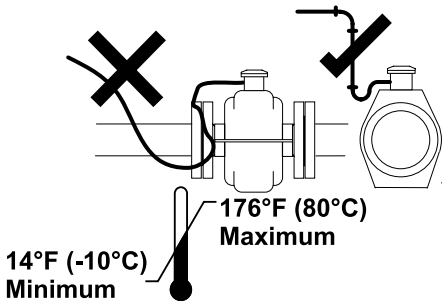


Fig. 2.14 Cable Routing

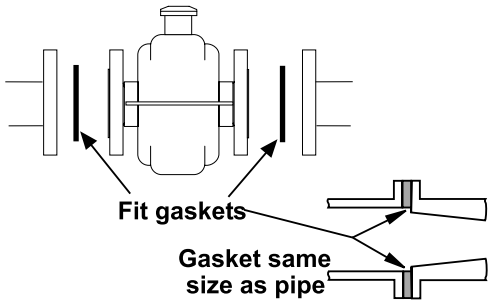


Fig. 2.15 Gasket Fitting

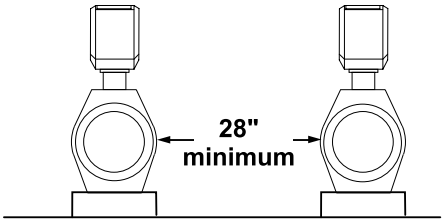


Fig. 2.16 Separation of Sensors

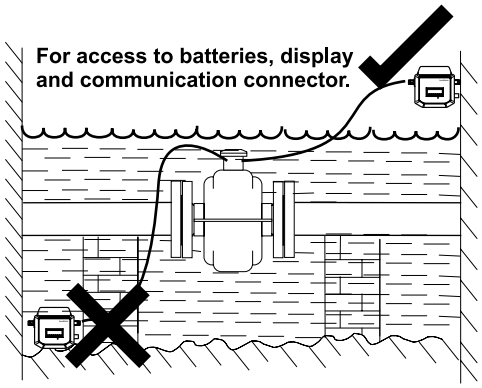


Fig. 2.17 Access to Transmitter

2.3 Mechanical Installation

2.3.1 Transmitter

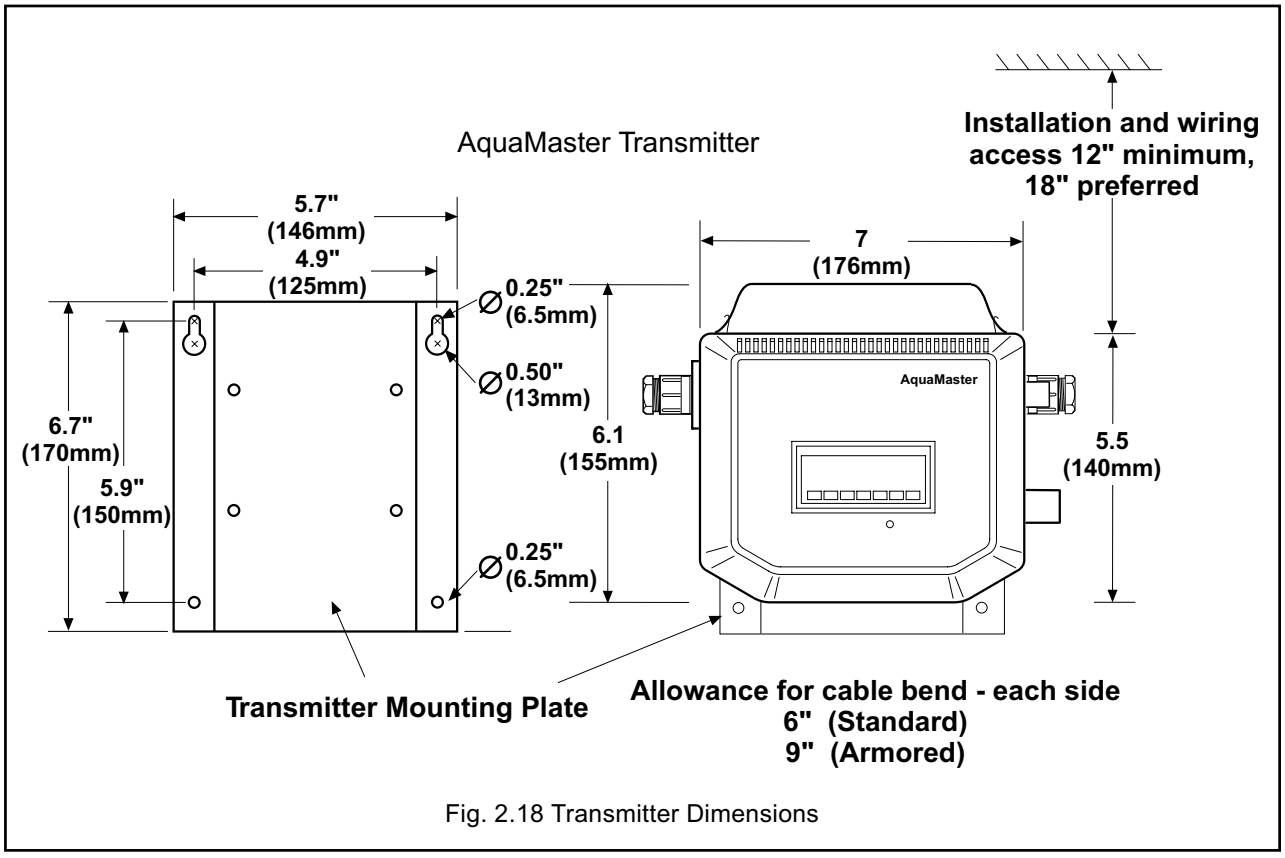
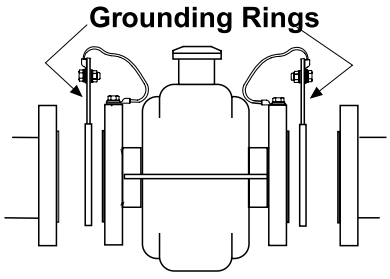


Fig. 2.18 Transmitter Dimensions

3.1 Grounding (Figs. 3.1 to 3.2)

Note. The requirement is to electrically bond the sensor to the pipeline/fluid. Diagrams illustrate methods that meet the requirement.



Sensor Size	Grounding Ring
5/8" to 3" (15 to 80mm)	Not required.
≥ 4" (100mm)	1 off required (supplied)

Fig. 3.1a Plastic Pipeline

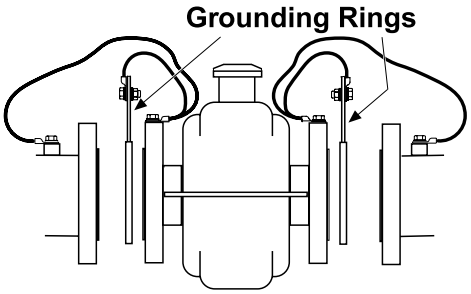
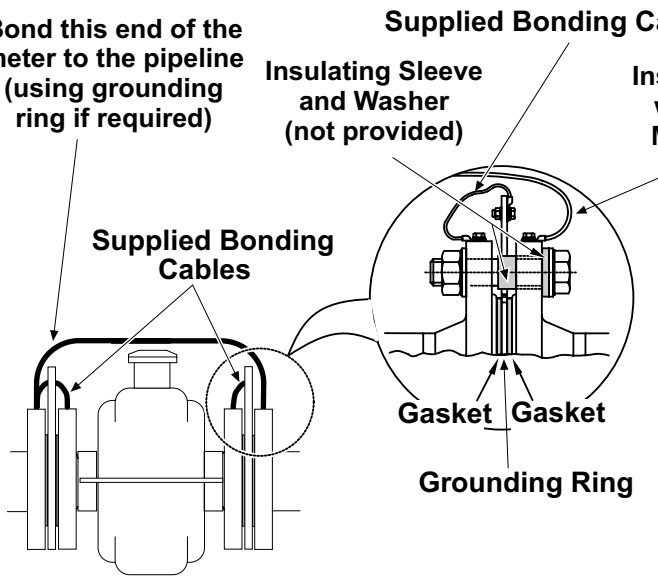


Fig. 3.1b Lined Metal Pipe


Bond this end of the meter to the pipeline (using grounding ring if required)
Supplied Bonding Cable
Insulating Sleeve and Washer (not provided)
Insulated connecting wire (not included). Must be adequately rated to carry cathodic currents.
Supplied Bonding Cables
Gasket
Gasket
Grounding Ring

Note. 5/8" to 1" threaded end sensors will require a plastic isolation section in the pipe, and a cathodic current bypass wire.

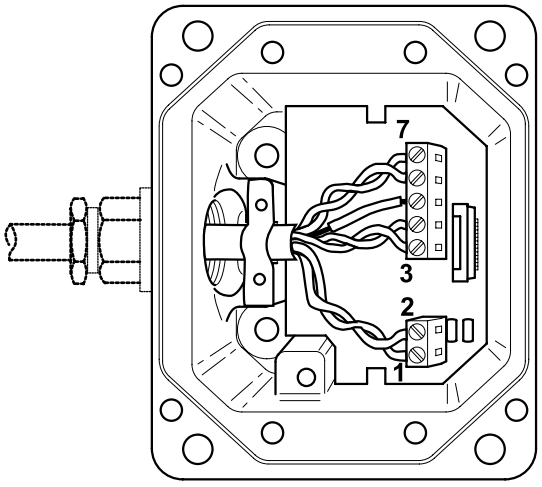
Caution. Do NOT ground Cathodically Protected Systems.

Fig. 3.2 Pipelines *with* Cathodic Protection

3.2 Connections
3.2.1 Sensor Terminal Box Connections (Remote Versions Only)

Caution. (Remote versions)

- **Remove foil screens completely, and plastic/foil screens and any fillers**
- **Twist the three screen wires together and sleeve them.**
- **Keep cable pairs twisted.**
- **Make connections only as shown.**
- **Maintain Environmental Protection at all times.**
- **Conduit connections must provide cable entry sealing.**



CABLE

__7 Violet
__6 Blue
__5 Sleeved Grounds
__4 Yellow
__3 Orange
__2 Red
__1 Brown

Maximum Cable Lengths

STT 4000 Series: ≤250 ft.
STT 4005 Series: ≤650 ft

Fig. 3.5 Sensor Terminal box Connections (Remote Version)

(Remote Versions Only)

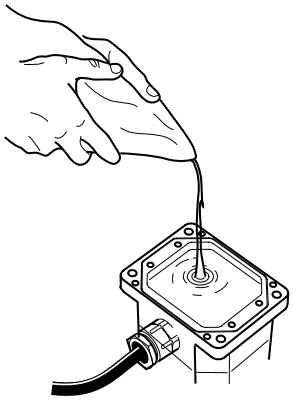


Fig. 3.6 Potting the Terminal Box

Warning.

- Potting materials are toxic — use suitable safety precautions.
- Read the manufacturer's instructions carefully before preparing the potting material.
- The remote sensor terminal box connections must be potted immediately on completion to prevent the ingress of moisture.
- Check all connections before potting see ELECTRICAL INSTALLATION.
- Do not overfill or allow the potting material to come into contact with "O" rings or grooves.
- Do not let potting material enter conduit, if used.

3.2.3 Transmitter Connections

Caution.

- **To ensure cable glands seal, use cable of diameter 0.08 to 0.24 in (2 to 6mm) [M16] only.**
- **Ensure cable glands are tightened after wiring. However, overtightening a plastic cable gland will break it and destroy its sealing property. It is recommended that cable glands are tightened finger tight initially, then a further 1/2 to 3/4 turn applied using a suitable spanner.**
- **Ensure that "O" ring seals and mating surfaces are clean, to maintain environmental rating.**
- **For IP68 protection where the transmitter could be submerged, the termination area must be potted — see Section 3.3.9.**

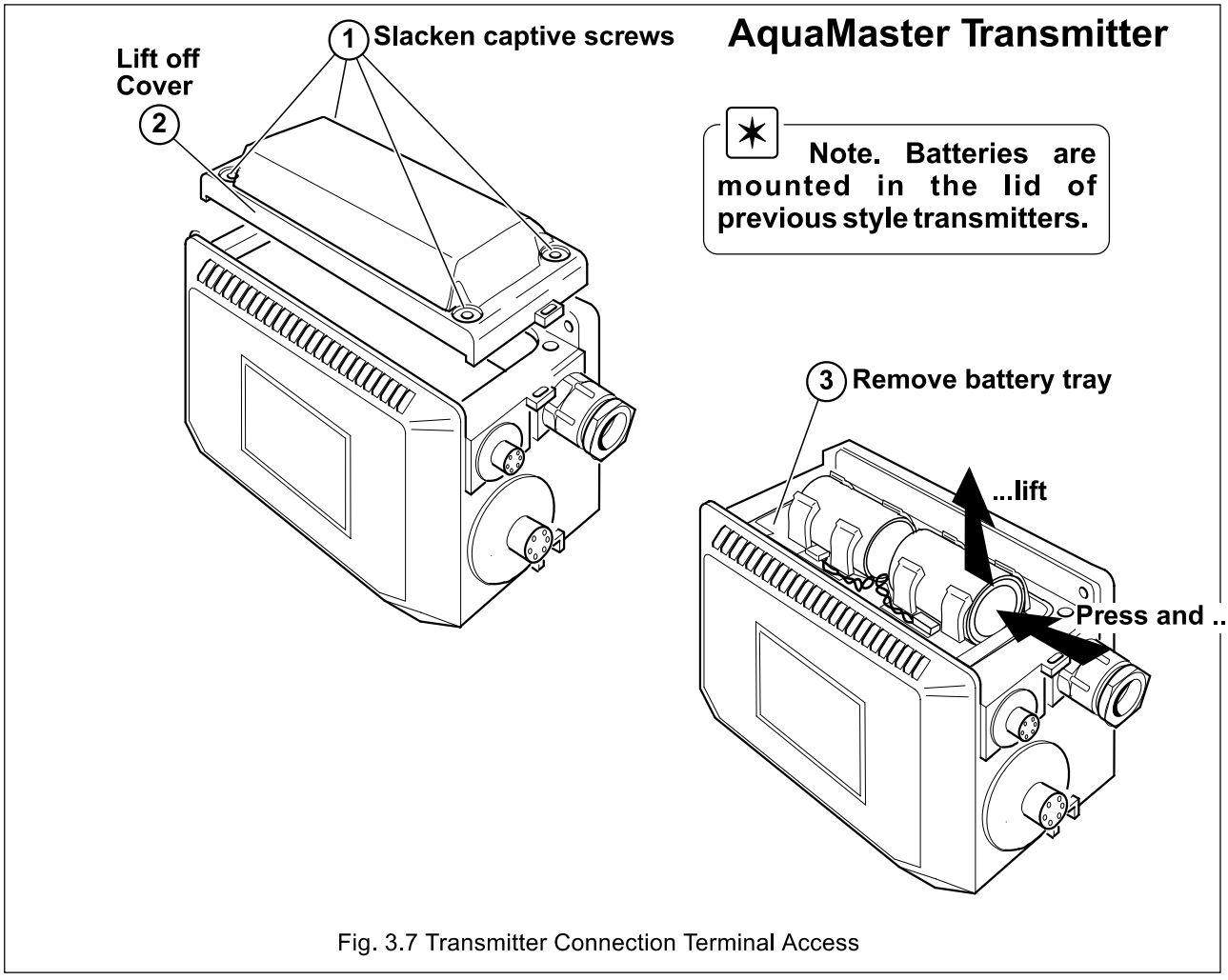


Fig. 3.7 Transmitter Connection Terminal Access

AquaMaster Transmitter

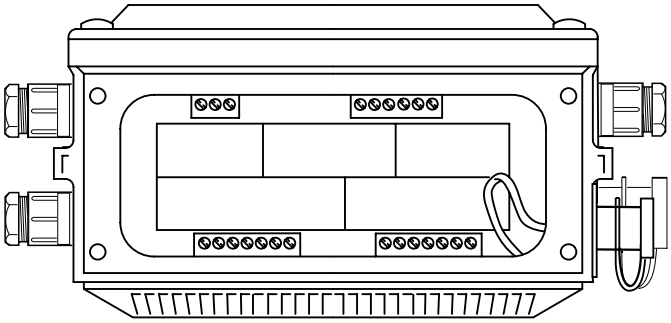
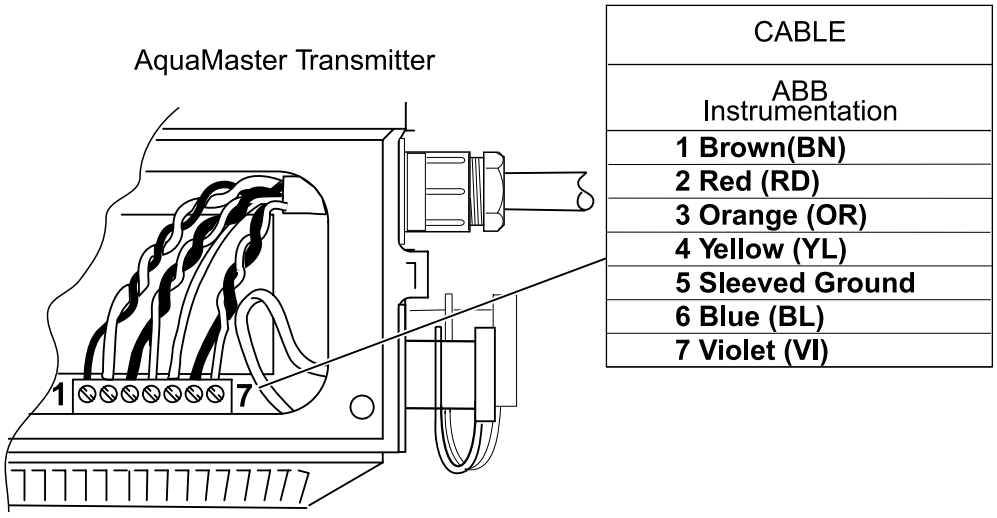


Fig. 3.8 Transmitter Connections (Glands/Conduit Entry)

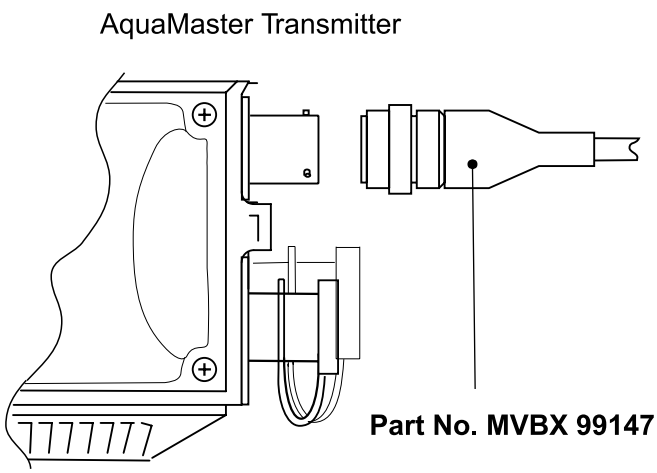
Caution. (Remote versions)

- **Remove foil screens completely, and plastic/foil screens and any fillers**
- **Twist the three screen wires together and sleeve them.**
- **Keep cable pairs twisted.**
- **Make connections only as shown.**
- **Maintain Environmental Protection at all times.**
- **Conduit connections must provide cable entry sealing.**



CABLE
ABB Instrumentation
1 Brown(BN)
2 Red (RD)
3 Orange (OR)
4 Yellow (YL)
5 Sleeved Ground
6 Blue (BL)
7 Violet (VI)

Fig. 3.9 Sensor Cable Connections (Gland/Conduit, Remote version)



✶ **Note. This arrangement is an option.**

Fig. 3.10 Sensor Cable Connections (Connector, Remote version)

3.3 Input/Output Connections

Caution.

- **Refer to SPECIFICATION SHEET for Input/Output ratings.**
- **Inductive loads must be suppressed or clamped to limit voltage swings**
- **Operation of outputs is programmable — see Quick Reference Programming Guide for details.**
- **External isolators not normally required, as the pulse and alarm circuit is electrically separated from all other AquaMaster connections.**
- **Capacitive loads must be inrush current limited.**
- **Fully floating pulse outputs may be subject to static damage, e.g. connecting to a floating datalogger, unless "COM" is operated within its galvanic isolation range (±35 V) from earth.**
- **Recommended protection for floating output systems is to wire "COM" to "0V".**

3.3.1 Frequency Outputs - Fig. 3.11

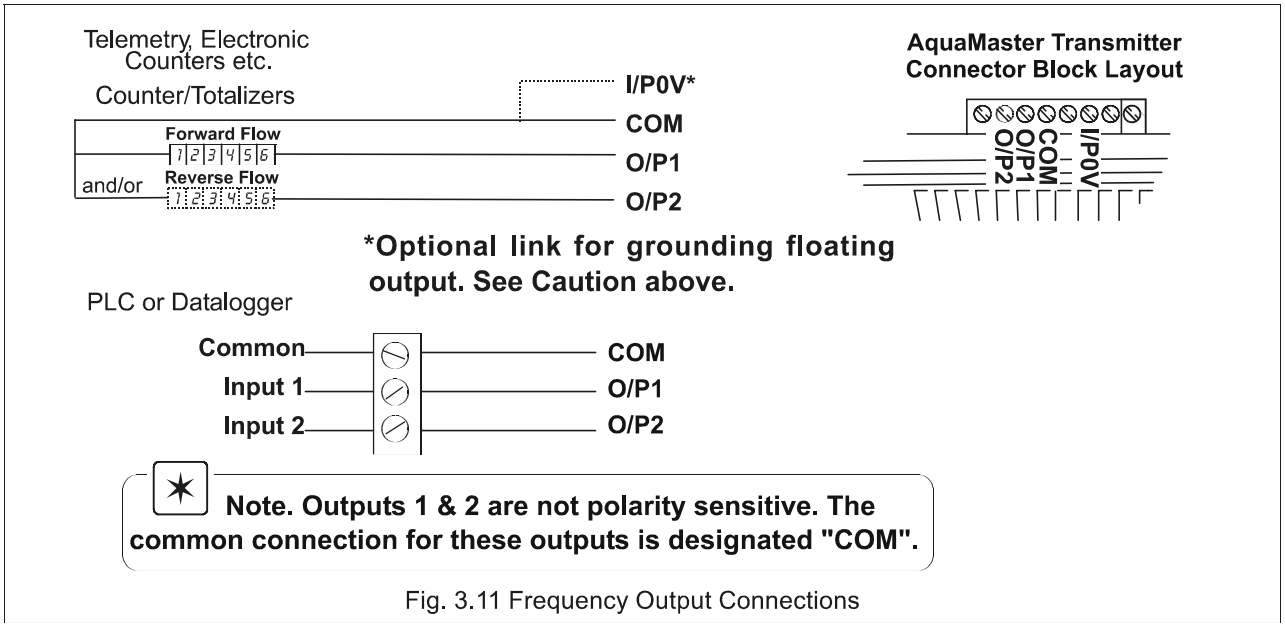


Fig. 3.11 Frequency Output Connections

3.3.2 Alarm Interface - Fig. 3.12

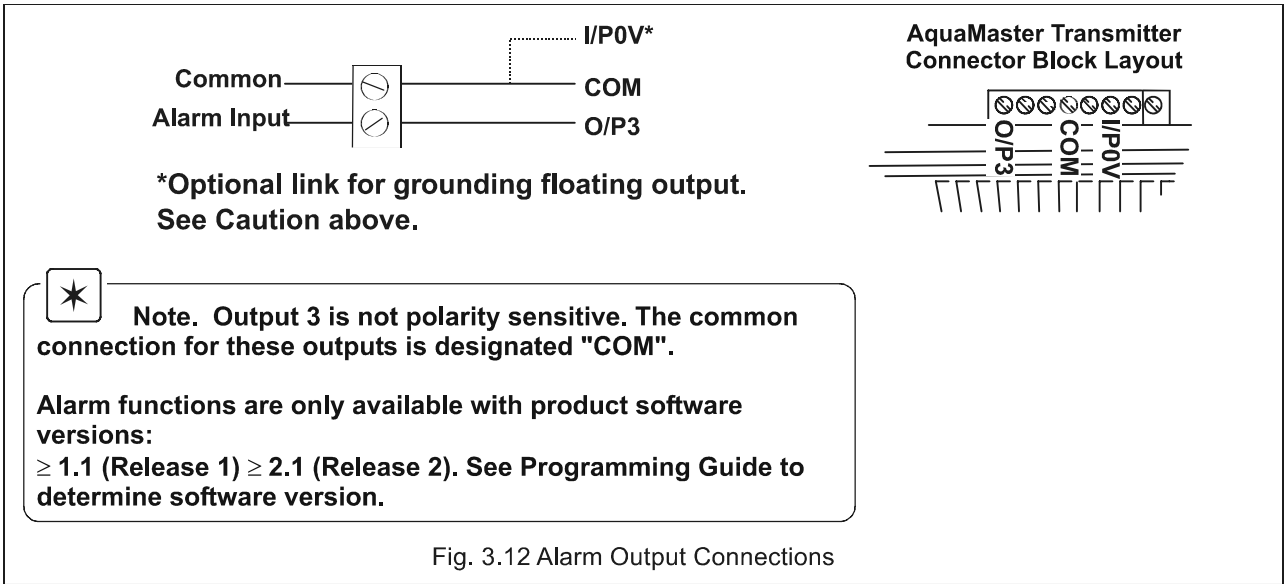
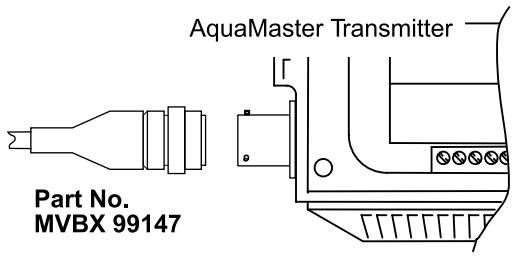

I/P0V*
Common
Alarm Input
COM
O/P3
AquaMaster Transmitter Connector Block Layout
O/P3
COM
I/P0V
*Optional link for grounding floating output. See Caution above.
Note. Output 3 is not polarity sensitive. The common connection for these outputs is designated "COM".
Alarm functions are only available with product software versions:
≥ 1.1 (Release 1) ≥ 2.1 (Release 2). See Programming Guide to determine software version.

Fig. 3.12 Alarm Output Connections

3.3.3 MIL connector Input/Output connections (Option) - Fig. 3.13



Pin	Name	Function	Colour (Output cable)
A	—	Reserved	
B	—	Reserved	
C	—	Reserved	
D	O/P 1	Forward Pulses or Forward & Reverse Pulses	Orange
E	—	Reserved	
F	O/P 2	Reverse Pulses or Direction Indicator	Blue
G	O/P Com†	Common	Drain Wire/Screen
H	—	Reserved	
J	I/P Gnd	Input Common	White
K	I/P+	Contact Input	Violet
L	RXD	Receive data (serial input connection) #	Turquoise
M	TXD	Transmit data (serial output connection) #	Brown
N	RTS	Request to send #	Red/Black *
P	CTS	Clear to send #	Yellow/Red *
R	—	Reserved	
S	—	Reserved	
T	RI	Ring Indicator #	Yellow
U	—	Reserved	
V	Serial GND	Comms Ground #	Green

 # When Remote Comms. Option is fitted

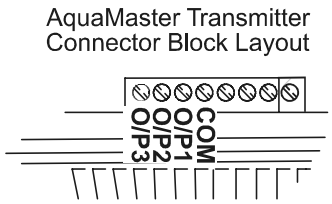
*** Not fitted on older cables**

† Note Caution regarding fully floating outputs. Recommended protection for floating output systems is to wire G to J.

Fig. 3.13 MIL Connector Connections

3.3.6 MIL Connector Input/Output (Option) - AquaMag™ x10 Pulse Ouput Compatibility

Where an existing installation has been wired to operate from the x10 outputs of an AquaMag™, the wiring of the AquaMaster™ connector can be altered to suit, as shown in Fig. 3.14.



Terminal	AquaMag/ AquaMag x1	AquaMag x10
COM	Grey/Blue	Grey/Blue
O/P 1	Orange	White/Red
O/P 2	Blue	White/Black

Note. Some data logger leads contain components which convert forward and reverse pulses into a single pulse line with a direction signal. Such leads will NOT work with AquaMaster, and are unnecessary as AquaMaster directly provides the correct signals for these loggers.

Fig. 3.14 MIL Connector Input/Output Connections

3.3.5 Encoder Ouput (Standard Option AquaMaster Only) - Fig. 3.15

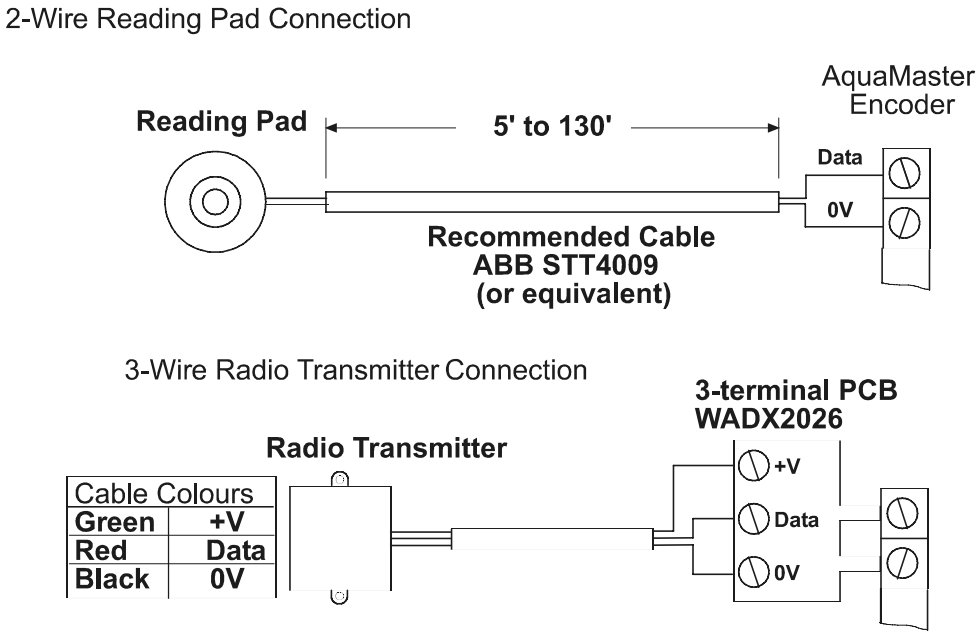


Fig. 3.15 Encoder Output Connections

3.3.6 Local Computer Connection - Fig. 3.16

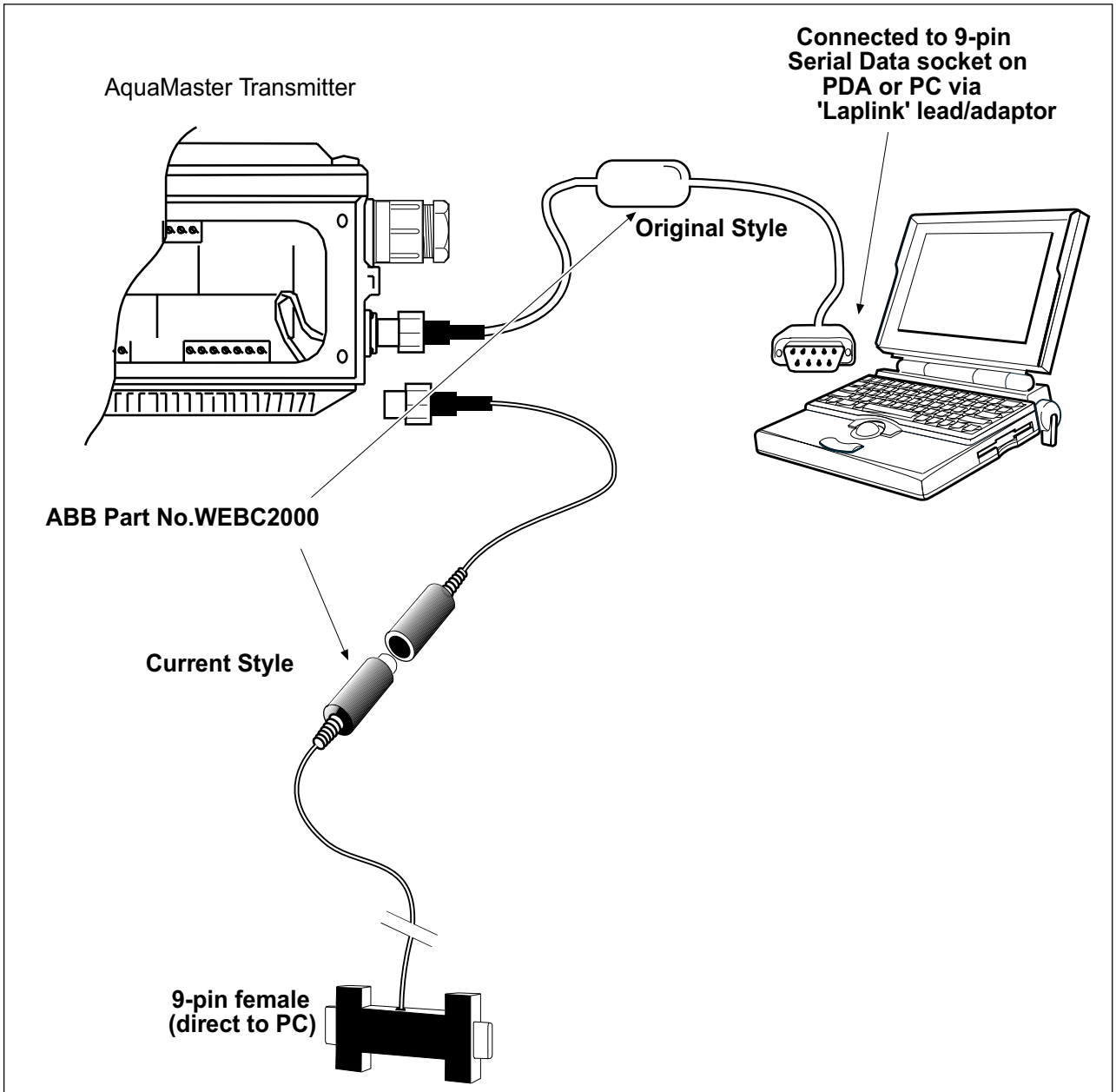


Fig. 3.16 Local Computer Connections

3.3.7 Remote Computer Connection - Fig. 3.17

AquaMaster Signal (DTE)	Modem (DCE) Plug *			Terminal/PC (DTE) Socket		
	Name	DB9	DB25	Name	DB9	DB25
RXD	**RXD**	**2**	**3**	**TXD**	**3**	**2**
TXD	**TXD**	**3**	**2**	**RXD**	**2**	**3**
RTS	**RTS**	**7**	**4**	**CTS**	**8**	**5**
CTS	**CTS**	**8**	**5**	**RTS**	**7**	**4**
RI	**RI**	**9**	**22**	**—**	**NC**	**NC**
GND	**GND**	**5**	**7**	**GND**	**5**	**7**

*** Also mates with PDA 'PC-Link cables**

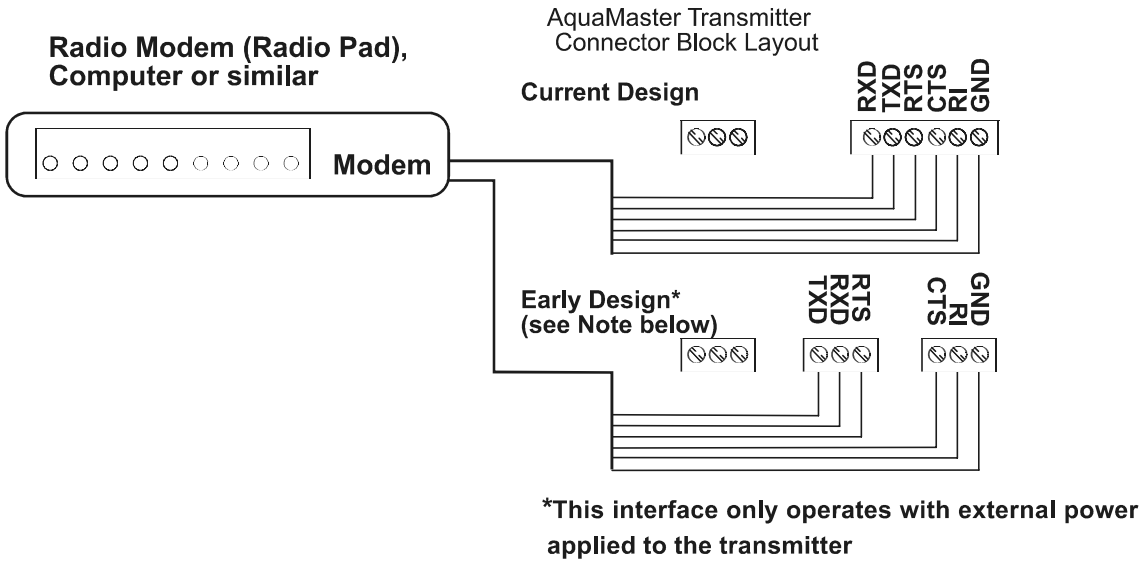


Fig. 3.17 RS232 Connections

3.3.8 Power Supply connection - Fig. 3.18

Warning.

- **DISCONNECT THE SUPPLY FROM ANY CABLES BEING TERMINATED ON THE TRANSMITTER.**
- **Electrical installation and earthing (grounding) must be in accordance with relevant national and local standards.**

Note. Power supply connections/earthing arrangements are identical for cathodically protected remote transmitter systems. For cathodically protected integral transmitter systems, follow cathodic installation practices.

Warning.

All units with **Remote, Battery only** transmitters must be grounded to an external ground source using the transmitter's external grounding screw. If no external ground source is available, it can be grounded to the meter's flange or to the meter's grounding ring.

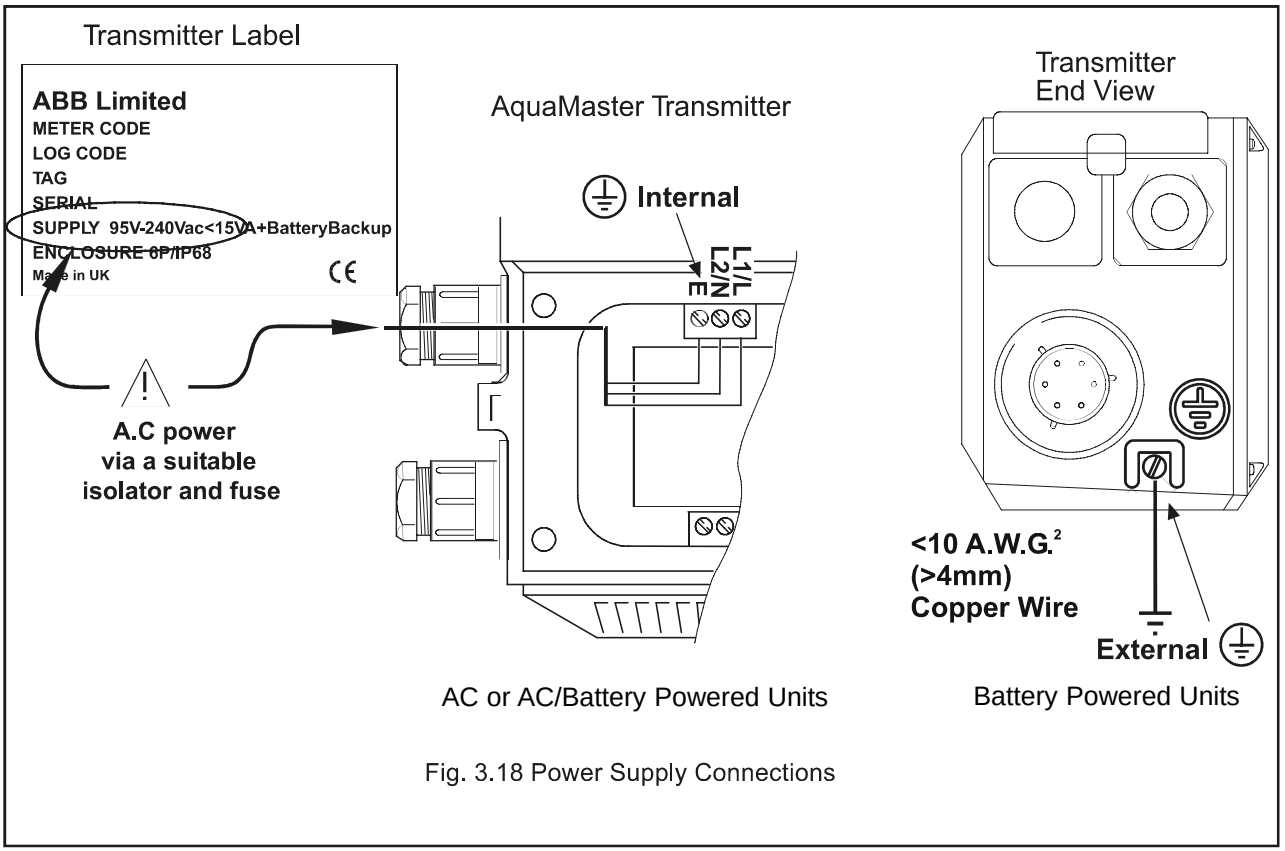


Fig. 3.18 Power Supply Connections

3.3.9 Pressure Transducer (Optional AquaMaster S only)

Optional pressure transducer cables are available for a range of pressures and cable lengths.

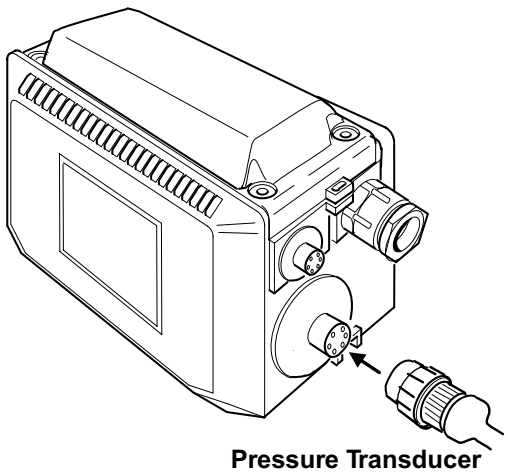


Fig. 3.19 AquaMaster fitted with OptionalPressure Transducer Connector

⚠ Caution. Ensure that only the pressure transducer supplied with the transmitter is used.
Use of other pressure transducers will require alteration of the pressure span and zero factors in the transmitter — see Quick Reference Programming guide.

3.3.10 Environmental Protection - Sensor Potting

Fig. 3.20a

1. Remove lid from transmitter.

Fig. 3.20b

2. If fitted, note position of batteries and then remove from battery tray.

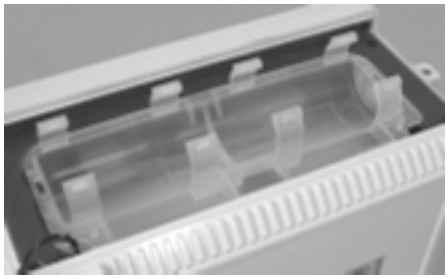


Fig. 3.20c

3. Remove battery tray by pushing right-most clips towards the left and lifting

Caution.
Insure that battery lead(s) are pulled clear of termination area.

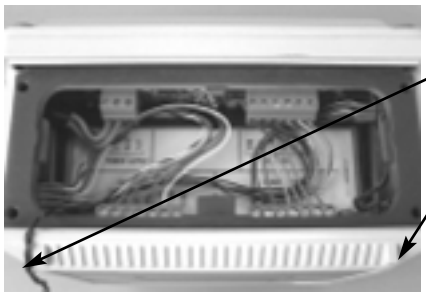


Fig. 3.20d

4. Check to insure that all required cables are fitted correctly and that either a connector, gland or blanking plug seals all gland holes.

Caution.
Potting must not be allowed to come in contact with this space.

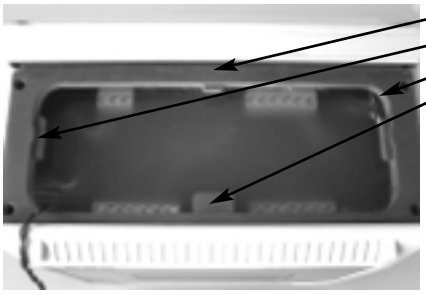


Fig. 3.20e

5. Carefully pour potting into termination area, until potting just covers the terminal blocks.
   To prevent possibility of short circuit, potting compound should cover all terminal screw heads.

Fig. 3.20f

6. Re-insert battery tray. Gently press down on the battery tray so that the potting level rises.
7. Leave to stand for 15 minutes to allow potting to gel.
8. If present, refit batteries to original positions and refit lid.

Warning.

- **The lithium battery used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 212°F or incinerate.**
- **Replace battery with an ABB part only. Use of another battery may present a risk of fire or explosion.**
- **Dispose of used battery promptly. Keep away from children.**
- **Dispose of used batteries in accordance with your local regulations.**
- **Where possible, recycle used batteries.**
- **Contact your local environmental authority for further information regarding disposal or recycling schemes for used batteries.**

Note. Each battery must be connected to the cable from the same side of the termination area as the battery position.

4.1 Connecting Batteries

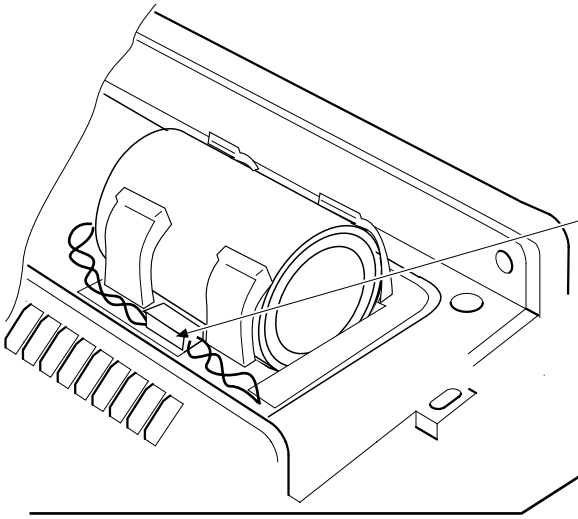
The AquaMaster has been supplied with one or two batteries, but not connected. To connect see Fig. 4.1

4.2 Start-up

If the AquaMaster is received with a protective plastic film over the display window, remove this film before commencing normal operation.
When the power is connected or the plastic film is removed, the AquaMaster performs a self test operation, and indicates a successful completion with “Pass” displayed.
If the display shows “Err1”, remove all power, check the sensor wiring and apply power.
If the display shows “Err 2 or 3”, contact ABB Service.

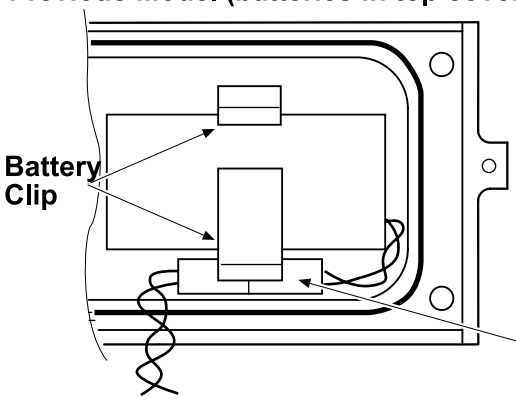
AquaMaster Transmitter

Current Model (top cover removed)



1) **Remove the top cover of the transmitter — see Section 3.2.3.**
2) **Connect the battery or batteries to the wire connector(s) inside the top of the transmitter unit.**
3) **Push the connection(s) into the recess as shown ensuring that the wires are NOT lying on the mating surface.**
4) **Fit the cover and ensure the screws are tightened fully.**

Previous Model (batteries in top cover)



1) **Remove the top cover of the transmitter — see Section 3.2.3.**
2) **Slide out the connector from behind the battery clip.**
3) **Connect the battery or batteries to the wire connector(s) inside the top of the transmitter unit.**
4) **Ensure that the end of the battery with the connection wires is pushed up against the inside end of the top cover.**
5) **Push the connection centrally behind the battery clip to secure the battery.**
6) **Fit the cover and ensure the screws are tightened fully.**

Fig. 4.1 Connecting Batteries

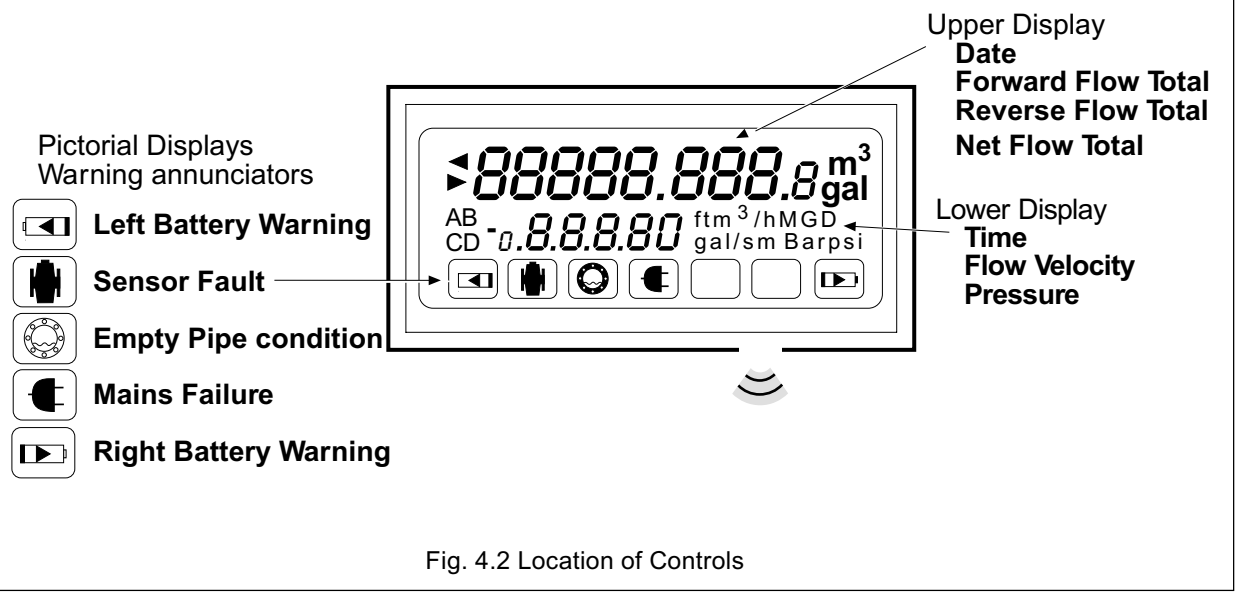


Fig. 4.2 Location of Controls

4.3 Display Activation

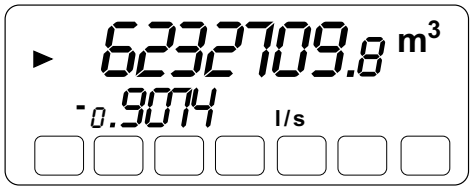
For normal operation, activate the light sensitive display by first covering the display area totally.
On removing the covering, the display activates and cycles through the programmed set of display measurements.

With external a.c. power applied, the display is permanently activated.

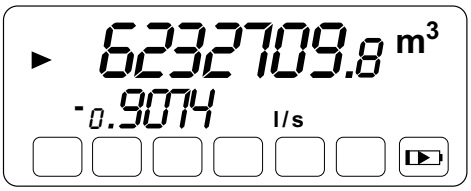
Information. For the use of local or remote serial communication and how to alter the displayed set of measurements, or instrument setup, see the Quick Reference Programming Guide.

4.4 Replacing a Battery - Fig. 4.3

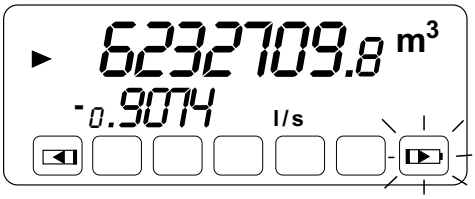
Note. Each battery must be connected to the cable from the same side of the termination area as the battery position in the battery holder or lid. For dual battery units, replace only the battery indicated by the battery legend described on the following page.



Normal Operation
If both batteries are good, then no battery alarm is indicated.



Replace Battery
When a single, **steady** battery icon is shown, replace the cell on the side indicated - in this example, the right battery. Wait approximately three seconds after disconnecting the battery before connecting the new battery. DO NOT change the battery if the icon is flashing



Replace both batteries
Important. If both batteries require replacement, first change the cell indicated by the steady icon - in this example, the left battery. The flashing icon indicates the battery currently in use.

4.4.1 Spare Kits.

Metal Transmitter

Current Model (flat cover version)

Battery Kit comprises 1 battery and one seal ..... MEFA 9947
Lid assembly ..... MEFA 9948

Previous Model (domed cover version)

Battery Kit comprises 1 battery and one seal ..... MEFA 9949
Lid assembly ..... MEFA 9950

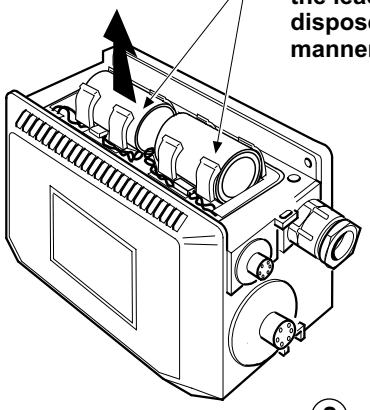
Public Transmitter

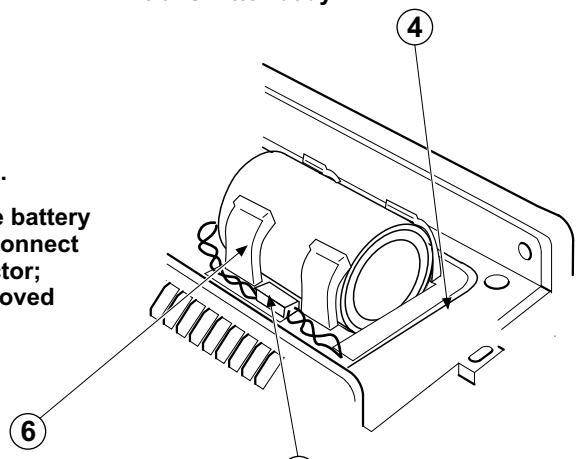
Replacement Battery ..... WABC 2001

4.4.2 Battery Changing Procedures - Figs. 4.3, 4.4 and 4.5

Note. Before changing batteries in a dirty environment it is recommended that the new 'O'-ring is fitted to the new lid (or cleaned lid from a previous installation) in a clean area, then re-sealed in a poly bag. This should minimize contamination by dirty fingers during the following procedures.

1. If the transmitter is not fixed in any way arrange or hold it with the top cover uppermost.
2. Using plain water, wash off any loose dirt from the outside of the case.
3. Remove the top cover of the transmitter — see Section 3.2.3 — to expose the batteries.
4. Using a "wet" tissue wipe the "O"-ring mating surface around the opening into the transmitter body.
5. Unclip the appropriate battery from the tray and disconnect the lead at the connector; dispose of in the approved manner.
6. Fit a new battery from the battery kit into the clips.
7. Ensure that the connector is tucked in the recess and that the wires are NOT lying on the "O"-ring mating surface.
8. Fit new silica gel bag; dispose of existing bag.
9. Fit the new "O"-ring (supplied with the battery) into a new or recycled lid assembly.
10. Fit the new cover and ensure the screws are tightened fully.



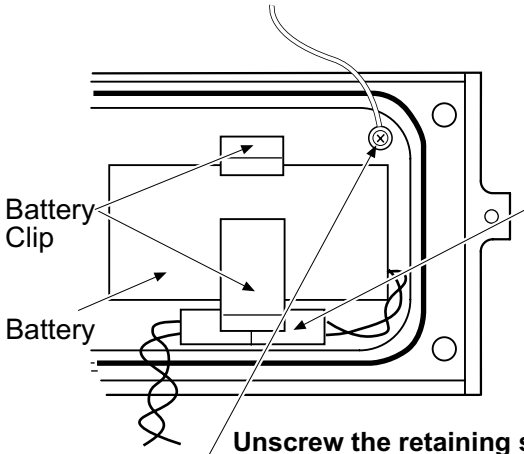


Finally — the removed lid assembly is to be washed under running water, using a brush if necessary, dried and sealed in a plastic bag for later re-use.
Dispose of old "O"-ring seal.

Fig. 4.3 Battery Changing Procedure (current version of transmitter)

① **Use plain water to wash off any loose dirt from the outside of the transmitter case. Small amounts of soiling may be removable with a "wet" tissue alone.**

② **Remove the top cover of the transmitter — see Section 3.2.3 to reveal the batteries clipped in the cover.**



③ **Using a "wet" tissue wipe the "O" ring mating area around the opening into the transmitter body.**

④ **Slide out the connector from behind the battery clip of the flat battery and pull apart.**

⑤ **Remove the battery and dipose of it in the approved manner.**

⑥ **Slide out the other connector from behind the battery clip and unclip the remaining battery *but do not disconnect it.***

⑦ **Unscrew the retaining straps (one shown) and retain the old lid (see "Finally" below).**

⑧ **Fit the new "O"-ring (supplied with the battery) into a new or recycled lid assembly.**

⑨ **Attach the the restraining straps (removed in ⑦) to the new/recycled lid.**

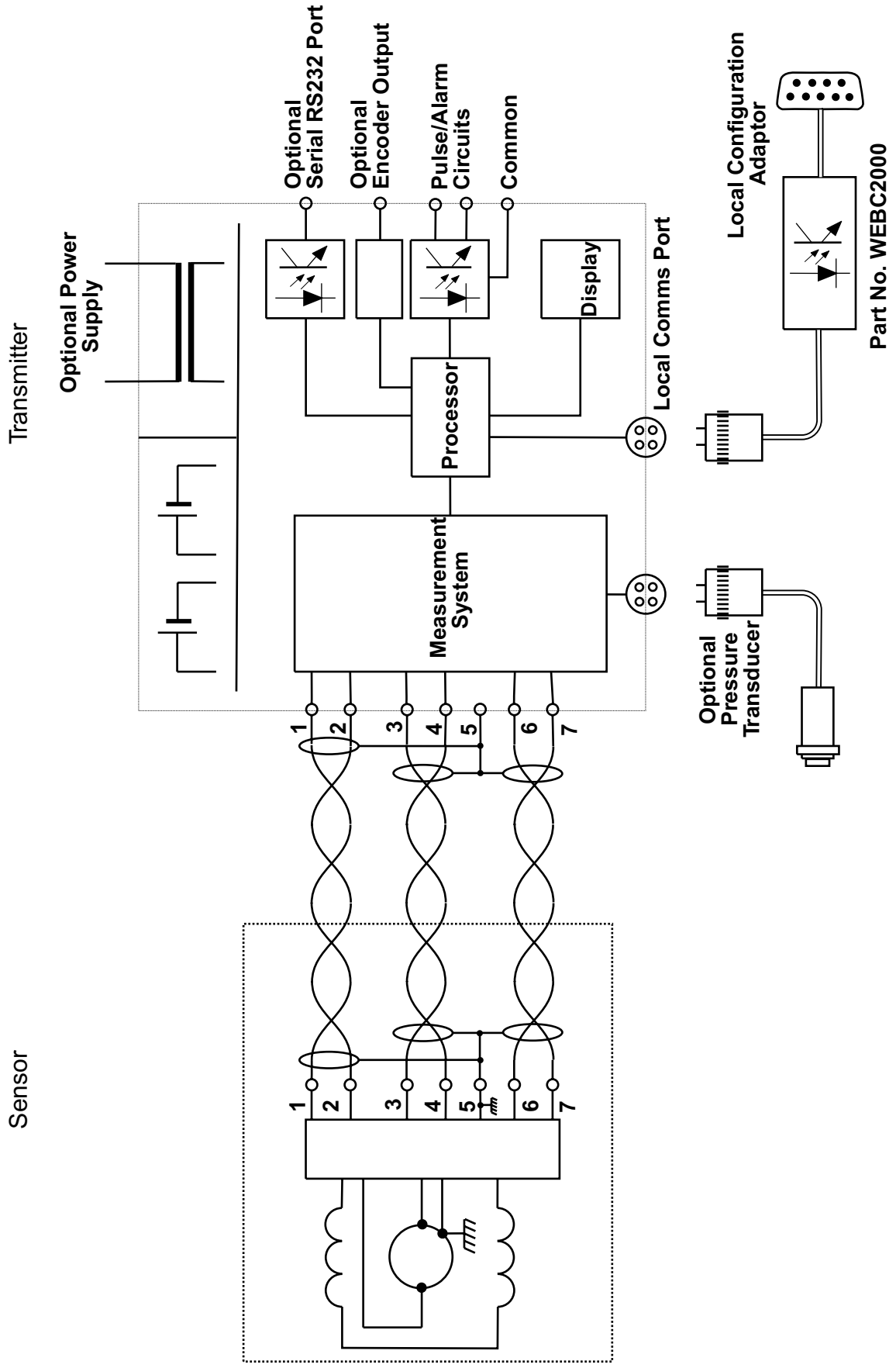
⑩ **Fit the current battery into the clip and push the connection centrally behind the clip to secure the battery.**

⑪ **Repeat step ⑩ using the new battery from the kit supplied, and fit the cover ensuring the screws are tightened fully.**

Finally — the removed lid assembly is to have the "O"-ring discarded, be washed under running water, using a brush if necessary, dried and sealed in a plastic bag for later re-use.

Fig. 4.4 Battery Changing Procedure (previous version of transmitter — domed cover)

APPENDIX - AQUAMASTER BLOCK DIAGRAM



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